

REMARKS/ARGUMENTS

This responds to the Office Action dated 14 July 2004. Applicant respectfully requests reconsideration of the application in view of the foregoing amendments and following remarks. Claims 1-6, 8-10, 13, 15, and 23 have previously been canceled. New claims 26 and 27 have been added. Therefore, claims 7, 11, 12, 14, 16-22, and 24-27 remain pending in the application.

Rejection of Claims 7, 12, 14, 16-18, and 23-25 Over Woodhead et al. in View of Kaufmann and Ida

Claims 7, 12, 14, 16-18, and 23-25 are rejected under 35 U.S.C. § 103 over Woodhead et al. (U.S. Patent No. 5,148,125) in view of Kaufmann (Austrian Patent No. AT 403213B) and Ida (U.S. Patent No. 4,177,434). The Examiner alleges that the Woodhead et al. patent discloses the elements of the rejected claims generally, with the exception of a phase detector, including a semiconductor circuit indicative of a logical exclusive OR function, and a low pass filter. The Examiner indicates, however, that Kaufmann and Ida disclose the limitations missing from Woodhead et al., and that it would have been obvious to combine the teachings of Kaufmann and Ida with the teachings of Woodhead et al.

As the Examiner knows, for a proper § 103 rejection, there must be a *motivation* to combine the teachings of the cited references and a *reasonable expectation of success* by combining reference teachings. *In re Vaeck*, 947 F.2d 488 (Fed. Cir. 1991). However, as discussed below, there is no motivation to combine the teachings of Woodhead et al., Kaufmann, and Ida. There is also no reasonable expectation of success by combining the teachings of the cited references.

To begin with, Applicant notes that there are two general well-known ways of measuring soil moisture: (1) measuring the charging rate of a capacitor, and (2) measuring the propagation velocity of an electromagnetic wave through a conductor. Many circuits have been designed over the years to measure dielectric constants using both methods. However, each method takes a fundamentally different approach to measurement, and the circuits from one method would not and could not be successfully combined with the other by one of ordinary skill in the art.

Woodhead et al. teaches measuring the propagation velocity of an electromagnetic wave through a conductor. Kauffman, on the other hand, teaches measuring the charging rate of a capacitor. Woodhead et al. and Kauffman each take a fundamentally different approach to soil moisture measurement and therefore use fundamentally different circuits. To be sure, each uses building blocks well known to any competent electrical engineer, but the circuits taught by Woodhead et al. and Kaufmann function in entirely different ways, and it is impossible to modify one according to the teachings of the other and make either useful. Therefore, there is no motivation to combine teachings between two circuits that each take a fundamentally different approach to water measurement.

“Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching, suggestion or incentive supporting the combination.” *In re Bond*, 910 F.2d at 834, 15 U.S.P.Q.2d at 1568, quoting *Carella v. Starlight Archery and Pro Line Co.*, 804 F.2d 135, 140, 231 U.S.P.Q. (BNA) 644, 647 (Fed. Cir. 1986) (affirming holding of nonobviousness); *see also, e.g., In re Stencel*, 828 F.2d 751, 755, 4 U.S.P.Q.2d (BNA) 1071, 1073 (Fed. Cir. 1987)

(reversing Board holding of obviousness); *ACS Hospital Systems, Inc. v. Montefiore Hospital*, 732 F.2d 1572, 1577, 221 U.S.P.Q. (BNA) 929, 933 (Fed. Cir. 1987) (reversing district court holding of obviousness). The Examiner has failed to establish that a skilled artisan would have an incentive or ability to combine teachings from multiples references (Woodhead et al., Kaufmann, Ida) that each disclose non-compatible, fundamentally different circuits.

Further, there is no expectation of success in combining the teachings of the cited references. In other words, no competent electrical engineer could combine the circuits taught by Woodhead et al. and Kaufmann to arrive at the claimed invention. The circuit taught by Woodhead et al., which measures propagation velocity, cannot be combined to any degree with even a portion of the circuit of Kaufmann, which measures the charging rate of a capacitor. There is simply no way to successfully combine such fundamentally different circuits. The combination of Woodhead et al. with Kaufmann is thus improper because there is no chance of successfully combining the reference teachings.

Moreover, Ida teaches nothing more than the general concept of control of electromechanical oscillators. The circuit taught by Ida has no relevance to the claimed invention, and thus no person of skill in the art of soil moisture measurement techniques would have looked to Ida for guidance. The Examiner does so now only with the benefit of hindsight. The Ida circuit uses a standard phase locked loop circuit. The purpose of the Ida circuit is again completely different from the circuit taught by Woodhead et al. The Ida circuit cannot even be categorized into either of the two soil measurement techniques mentioned above. A person of ordinary skill in the art would

have no motivation to combine a standard phase locked loop circuit as taught by Ida with both a circuit that measures propagation velocity as taught by Woodhead et al., and a fundamentally different circuit that measures the charging rate of a capacitor as taught by Kaufmann. Therefore, the combination of Ida with Woodhead et al. and/or Kaufmann is improper.

Similarly, there can be no expectation of success in combining the teachings of all three cited references. The circuits taught by Woodhead et al., Kaufmann, and Ida are fundamentally different and used for completely different purposes. There is no way to successfully combine the circuits.

Also, as the Examiner is aware, references cannot be combined if the combination destroys the teachings of any of the references. Applicant notes that claim 7 recites the use of an Exclusive OR phase detector. Woodhead et al. teaches a circuit specific to measuring wave propagation velocity, and does not disclose a phase detector. There would be no reason or purpose for including a phase detector in the Woodhead et al. device because the Woodhead et al. device is directed to a fundamentally different way of measuring soil moisture as compared to Kaufmann. The circuit of Woodhead et al. would not work if a phase detector was pulled from Kaufmann and "inserted" into Woodhead et al. Electrical circuits simply do not work that way. There is no way to simply "include a semiconductor circuit being indicative of a logical Exclusive OR function [to Woodhead et al.]" as stated by the Examiner. The entire Woodhead et al. circuit would have to be redesigned, which would destroy its function of measuring wave propagation velocity. A phase detector has no meaning with respect to the Woodhead et al. circuit. As mentioned above, Woodhead et al.

discloses a circuit for measuring velocity, not capacitor charging rate. Thus, to try and somehow combine some of the teachings of Kaufmann with Woodhead et al. would destroy the very purpose of the Woodhead et al. circuit. Accordingly, the combination of Woodhead et al. with Kaufmann is improper.

The combination of Woodhead et al. and Kaufmann further does not teach or suggest the claims that depend from claim 7. Kaufmann discloses an AND gate, not an Exclusive OR gate with its phase detector. Ida discloses an Exclusive OR gate, but not in the context of a circuit designed to measure the charging rate of a capacitor as taught by Kaufmann. Again, the Kaufmann circuit has no relation to and cannot simply be "modified" by the circuit taught by Ida. Therefore, even the combination of references cited by the Examiner would not yield a working circuit capable of measuring water content and including an Exclusive OR.

Applicant respectfully submits the citation of Kaufmann and Ida actually evidences the non-obviousness of including an Exclusive OR phase detector in the present invention. The Exclusive OR of the present invention gives a pulse during both the charging and the discharging cycles. If the threshold shifts to increase the pulse width on the charging cycle, it decreases the width on the discharge cycle by the same amount, so temperature, voltage, and chip to chip variations do not affect measurements. With the benefit of hindsight, as is always the case, it is clear that the Exclusive OR is a much better choice than the AND gate of Kaufmann. But the Kaufmann device was undoubtedly designed by a competent electrical engineer, yet Kaufmann failed to use the Exclusive OR gate. Thus, the failure of Kaufmann to choose the Exclusive OR, when doing so offers clear advantage, evidences that the

claimed invention was not obvious to one of ordinary skill in the art at the time it was made. None of the cited references -- Ida, Kaufmann, or Woodhead et al. -- teaches or suggests that an Exclusive OR gate can or should be used *in a charging rate measurement circuit* as claimed. Therefore, Applicant respectfully submits that the combination of Woodhead et al. with Kaufmann or Ida is improper.

Further, the same arguments above apply to claim 24. The combination of references is improper. Woodhead et al. does not provide a phase detector, and there is no motivation to add one. Woodhead et al. teaches a circuit for measuring wave propagation velocity, and its disclosure does not support a modification that would add a phase detector thereto. Circuits designed for completely different measurements cannot be "combined" when they are doing fundamentally different things. There would be no reason or purpose to add a phase detector to the Woodhead et al. circuit considering that the Woodhead et al. device has nothing to do with measuring phase. Phase detectors detect phase differences between multiple signals. Only one signal is involved in the Woodhead et al. device. Applicant submits that a person of ordinary skill in the art would not add a phase detector that could serve no purpose to the Woodhead et al. device, which would only destroy the purpose of the circuit.

Accordingly, Applicant respectfully requests that the rejection of claims 7, 12, 14, 16-18, and 23-25 under 35 U.S.C. § 103(a) over Woodhead et al. in view of Kaufmann and Ida be withdrawn.

Rejection of Claims 11 and 19-22 Over Woodhead et al. in View of Campbell et al., Kaufmann, and Ida

Claims 11 and 19-22 are rejected under 35 U.S.C. § 103 over Woodhead et al. in view of Campbell et al. and Kaufmann in view of Ida. The Examiner alleges that Woodhead et al. and Campbell et al. disclose time domain reflectometry. The Examiner also alleges that with respect to claims 19-22, Woodhead et al. discloses the elements of the rejected claims generally, with Campbell et al., Kaufmann, and Ida disclosing any elements not shown by Woodhead et al.

Applicant respectfully submits that the combination of *four* unrelated references, without more, evidences the impropriety of the rejection. This is classic hindsight. If it is necessary to string together four sources to disclose the elements claimed, it is difficult to see how the claim can be considered obvious. "An examiner cannot establish obviousness by locating references which describe various aspects of a patent applicant's invention *without also providing evidence* of the motivating force which would impel one skilled in the art to do what the patent applicant has done." *Ex parte Levengood*, 28 U.S.P.Q.2d 1300, 1301-02 (B.P.A.I. 1993) (emphasis added). The Examiner has not articulated any suggestion or incentive supporting the combination *from the cited references*, nor has the examiner provided any *evidence* of a motivational force that would impel a skilled artisan to combine the functions of a circuit designed to measure propagation velocity with a circuit designed to measure the charging rate of a capacitor.

The arguments proffered above apply equally to the rejection of claims 11 and 19-22. There is no motivation to combine references, each of which take fundamentally different circuit approaches and measure fundamentally different phenomenon. Nor can there be any expectation of successfully combining such fundamentally different

circuits. Campbell et al., like Woodhead et al., discloses a circuit directed to measuring the propagation velocity of an electromagnetic wave through a conductor. No one of skill in the art would combine a circuit designed to measure propagation velocity with a circuit designed to measure the charging rate of a capacitor as disclosed by Kaufmann.

Furthermore, the Examiner also knows that a proper § 103 rejection requires that the references teach all of claim limitations. *In re Vaeck*, 947 F.2d 488 (Fed. Cir. 1991). Claim 19 recites "first and second elongate members, each having substantially identical shape and size so that the first and second members mate with one another and are bonded together to form a sensor." The Examiner states that Woodhead et al. discloses elongate members at "column 2," but the citation is not specific. There is no allegation (or support for that matter) that Woodhead et al. discloses "each having substantially identical shape and size so that the first and second members mate with one another and are bonded together to form a sensor." Woodhead et al. does not mention anything in column 2 about mating first and second members that are bonded together. Therefore, the rejection of claim 19 and all claims that depend from claim 19 is improper and not supported by the cited references.

In view of the foregoing, Applicant respectfully requests that the rejection of claims 11 and 19-22 under 35 U.S.C. § 103(a) over Woodhead et al., Kaufmann, Campbell et al., and Ida be withdrawn.

New Claims

New claims 26 and 27 have been added. New claim 26 depends from claim 24 and should therefore be allowable for at least the same reasons cited above relating to claim 24. New claim 27 recites "a charging rate of a capacitor measuring circuit" sandwiched between two circuit boards and should also be allowable over the prior art. Support for the new claims is found, among other places, at page 3, lines 12-23; page 4, lines 1-3 and 18-22, page 5, lines 5-9; page 6, lines 1-9; and Figs. 1-3.

Conclusion

Applicant has made a good-faith effort to resolve all matters with respect to the present application. Applicant believes that the claims are in condition for allowance. If there are any matters yet to be resolved in connection with this application, Applicant requests the Examiner to telephone the undersigned attorney to expedite the handling of this matter.

Respectfully submitted,

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